REMARKS

The Specification has been amended on page 7, line 12, to include language from page 11, lines 17-21 of Application No. 09/349,592 (now Patent No. 6,407,492), which is the application incorporated by reference into the present application as specified on page 7, lines 10-11 of the Specification.

Claims 1-5, 24 and 25 are pending in the application. In the Office Action at hand, those claims are rejected.

Claim 4 is rejected under 35 U.S.C.§102(b) as being anticipated by EP 1376021. In addition, Claim 5 is rejected under Section 102(b) as being anticipated by EP 1376021, or being obvious under 35 U.S.C. §103(a) in view of EP 1376021. Also, Claims 1-5 are rejected under Section 103(a) as being unpatentable over Reuter in view of Helfritch. Furthermore, Claims 24 and 25 are rejected under Section 103(a) as being unpatentable in view of Reuter, Helfritch, Namba and Hirai. Finally, Claims 24 and 25 are rejected under Section 103(a) as being unpatentable over EP 1376021, Namba and Hirai. In response to the Section 102(b) and 103(a) rejections, the Applicant respectfully submits that Claims 1-5, 24 and 25, as amended, are not anticipated or obvious in view of EP 1376021, Reuter, Helfritch, Namba and Hirai. Reconsideration is respectfully requested.

The Applicant points out that EP 1376021 is not prior art to the claimed invention. The present application is a divisional application of Application No. 09/883,853 filed on June 18, 2001, which claims the benefit of Provisional Application No. 60/213,358, filed June 20, 2000 and provisional Application No. 60/214,577 filed June 28, 2000. Therefore, the present application has an effective filing date predating EP 1376021. Accordingly, Claims 4 and 5 are not anticipated or obvious in view of EP 1376021, and Claims 24 and 25 are not obvious in view of EP 1376021, Namba and Hirai. Reconsideration is respectfully requested.

Claim 1, as amended, recites a gas conversion system for removing NOx and SOx from gases and includes a duct having a rectangular cross section having a width and height through which the gases flow. The duct can have a port for introducing a reaction agent into the duct to the gases. First and second electron beam emitters each having a single exit window can be mounted to the duct and sealed over openings in the duct opposite from each other for directing

opposed electron beams into the duct and causing components of the NOx, SOx and reaction agent to react to remove NOx and SOx from the gases. The duct can be shaped and sized, and the electron beam emitters can be operated, positioned, configured, shaped and sized to generate generally straight uniform electron beams that provide complete continous electron beam coverage across the width and height of the rectangular cross section of the duct with generally evenly dispersed electrons. Claim 3, as amended, recites a treatment system, and Claim 4, as amended, recites an electron beam treatment system.

Claims 1, 3 and 4 have been amended to recite "first and second electron beam emitters each having a single exit window mounted to the duct and sealed over openings in the duct opposite from each other", and "the electron beam emitters being operated, positioned, configured, shaped and sized to generate generally straight uniform electron beams that provide complete continuous electron beam coverage across the width and height of the rectangular cross section of the duct with generally evenly dispersed electrons." Support for these amendments is found at least in FIGs. 1-5, as well as on page 5, lines 3-9, page 7, lines 9-12, and page 9, lines 10-25 of the Specification as originally filed.

In embodiments of the claimed invention, the electron beam emitters can be operated, positioned, configured, shaped and sized to provide generally straight uniform electron beams having generally evenly dispersed electrons to provide complete continuous uniform electron beam coverage across the width and height of the rectangular cross section of the duct, for example, as seen in FIGs. 3 and 4. The electron beam emitters are mounted and sealed over openings in the duct in a manner to allow complete coverage. The generally straight uniform electron beams with generally evenly dispersed electrons, can have a generally straight or non spreading configuration when entering the rectangular duct. Opposed generally straight uniform electron beams can be relatively easily combined to provide complete, continuous and uniform or even electron beam coverage with evenly dispersed electrons across the width and height of the rectangular cross section of the duct. In addition, by continuously generating the electron beams, complete continuous uniform coverage is obtained not only physically across the cross section of the duct, but also in electron beam duration at any given moment in time, in contrast to pulsed beams, or scanned beams. As a result, a gas, compound or substance flowing through the duct can be generally evenly, completely, uniformly and continuously treated with electrons at

any particular width or height location and time within the cross section of the duct, thereby resulting in consistent and thorough treatment.

In contrast, Reuter discloses a device for desulphurizing and denitrating flue gases having opposed electron accelerators 2 for irradiating gases flowing through a reaction canal 6. Each electron accelerator 2 has digital electron beam deflection 3 and scanning system 4. This results in an electron beam which is scanned or moved back and forth in an outwardly angled spreading or diverging formation as it enters the reaction canal 6, as seen in Fig. 2. The electron beam moves back and forth in order to sequentially or progressively cover the cross section of the reaction canal 6. As a result, at a given moment in time, there is always a portion of the reaction canal 6 that is not physically covered by the electron beam, resulting in nonuniform coverage, and in certain circumstances some gas could pass by without being irradiated. Since the electron beam is diverging, the electrons spread out and diverge from each other moving away from the electron accelerator 2, and the effect is more noticable or pronounced near the side regions of the electron beam. Consequently, the concentration or dispersion of the electrons in the reaction canal 6 from each electron accelerator 2 can be less at the sides of the reaction canal 6. This can result in additional uneven or nonuniform dispersion of electrons across the cross section of the reaction canal 6 with higher concentrations being at the center. An example of uneven or nonuniform dispersion of electrons and treatment from diverging electron accelerators can be seen in Fig. 1 of U.S. 5,015,443 (Ito), which was discussed in the Amendment filed by the Applicant on 9/24/2007. The graph of Fig. 4 of Reuter is an ionization curve for two sided irradiation, depicting the percentage of ionization for a certain amount of gas given in units g/m^2. This graph in Fig. 4 does not show the distribution of electrons across the cross section of the reaction canal 6, but rather the amount of gas ionized. Gas can be sufficiently ionized by unevenly or nonuniformly dispersed electrons, if the power is high enough so that the power in the regions having less electrons is at a high enough level. However, this can result in less efficient operation than in the present invention since central regions can have more than the required power.

Consequently, Reuter does not provide complete continuous uniform electron beam coverage with evenly dispersed electrons, physically uniformly across the cross section, and at a given moment in time, since the electron beam is scanned or moved to provide coverage, and is

diverging. In addition, FIG. 2, shows the exit windows 5 in Reuter positioned outside and next to the reaction canal 6, and therefore are not mounted to the duct and sealed over openings in the duct as in the claimed invention. Column 4, lines 41-47 of Reuter confirms this configuration by disclosing that the exit windows are "directly on the reaction canal" and "can be moved completely away from the reaction canal".

Helfritch discloses in FIG. 1 an electron beam gas scrubbing apparatus 10 which irradiates flue gases with pulsed or intermittent electron beams from electron accelerators 36 and has a source for adding ammonia. Helfritch shows in FIG. 1, three electron accelerators 36 mounted on one side of the reactor sequentially in the direction of flow, but can also employ six accelerators. By having pulsed electron accelerators 36, there is not complete continuous uniform electron beam coverage since the electron beams turn on and off, and some gas could in some circumstances, pass by a particular accelerator 36 without being irradiated. Helfritch does not teach or suggest opposed emitters, the shape of the electron beam that is generated, or the cross sectional shape of the conduit 34 that is irradiated by the electron accelerators 36. Since Helfitch teaches pulsed or intermittent electron beams, and does not specifically teach the cross sectional shape of the conduit or the shape of the electron beams, Helfritch cannot teach or suggest complete continuous uniform electron beam coverage across the width and height of a rectangular duct. However, it appears that the cross section of conduit 34 has a round shape based on FIG. 1 and the related description. Reference numeral 38 is described as a "conduit or pipe" on column 4, line 8, and in FIG. 1, is shown to be a continuation of conduit 34. Also in FIG. 1, the broken ends of the inlet and outlet pipes of apparatus 10 which includes conduit 34, are depicted with the standard drafting designation for round pipes.

Accordingly, Claims 1-5, as amended, are not obvious in view of Reuter and Helfritch since neither reference, alone in combination, teaches or suggests "first and second electron beam emitters each having a single exit window <u>mounted to the duct and sealed over openings in the duct</u> opposite from each other", and "the duct being shaped and sized, and the electron beam emitters being operated, positioned, configured, shaped and sized to <u>generate generally straight uniform electron beams that provide</u> <u>complete continuous electron beam coverage across the width and height of the rectangular cross section of the duct</u> with generally evenly dispersed

electrons," as recited in Claims 1, 3 and 4, as amended. Therefore, Claims 1-5, as amended, are in condition for allowance. Reconsideration is respectfully requested.

Namba discloses in FIG. 1 an irradiation chamber 2 irradiated by three electron beam generators 1 positioned and spaced apart from or above the irradiation chamber 2 sequentially in the direction of flow. As a result, the electron beam generators 1 are not mounted to and sealed over openings in the irradiation chamber 2, and the gas passes through both irradiation zones 3 and non irradiation zones 4. Column 3 teaches that ozone is generated by the electron beams. FIG. 2 discloses that a series of electron beam generators can be positioned spaced under or below the irradiation chamber 2 to provide opposed electron beams within the irradiation chamber 2. Namba does not disclose the cross sectional shape of the irradiation chamber 2, since FIGs. 1 and 2 only show side views. Therefore, Namba does not teach a duct with a rectangular cross section, as recited in the claimed invention. Additionally, the shape of the electron beams shown in FIGs. 1 and 2 have widths that vary with the distance or height away from the electron beam generators. In FIG. 1, the electron beams generated are narrower at the top and bottom, and in FIG. 2, the electron beams appear generally cone shaped and began to narrow at the center of the irradiation chamber 2. For electron beams as shaped in FIG. 2, there would be portions of the cross sectional area of the duct absent of electron beam coverage at least at the corners and possibly at the mid point of the left and right side edges, even if the duct were to have a rectangular cross section. It would appear that having nonirradiated portions of the cross section in Namba is not an issue since Namba relies on using nonirradiation zones 4 adjacent to irradiation zones 3 for improving the efficiency of nitrogen oxide removal.

Hirai discloses in Fig. 1 a deodorizing apparatus 10 having a UV lamp 30 and an ozone decomposing catalyzing layer 34 for decomposing ozone.

Accordingly, Claims 24 and 25, are not obvious in view of Reuter, Helfritch, Namba and Hirai, since none of the references, alone or in combination, teach or suggest "first and second electron beam emitters each having a single exit window mounted to the duct and sealed over openings in the duct opposite from each other", and "the duct being shaped and sized, and the electron beam emitters being operated, positioned, configured, shaped and sized to generate generally straight uniform electron beams that provide complete continuous electron beam coverage across the width and height of the rectangular cross section of the duct with generally

evenly dispersed electrons," as recited in base Claim 4, as amended. Therefore, Claims 24 and 25 are in condition for allowance. Reconsideration is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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